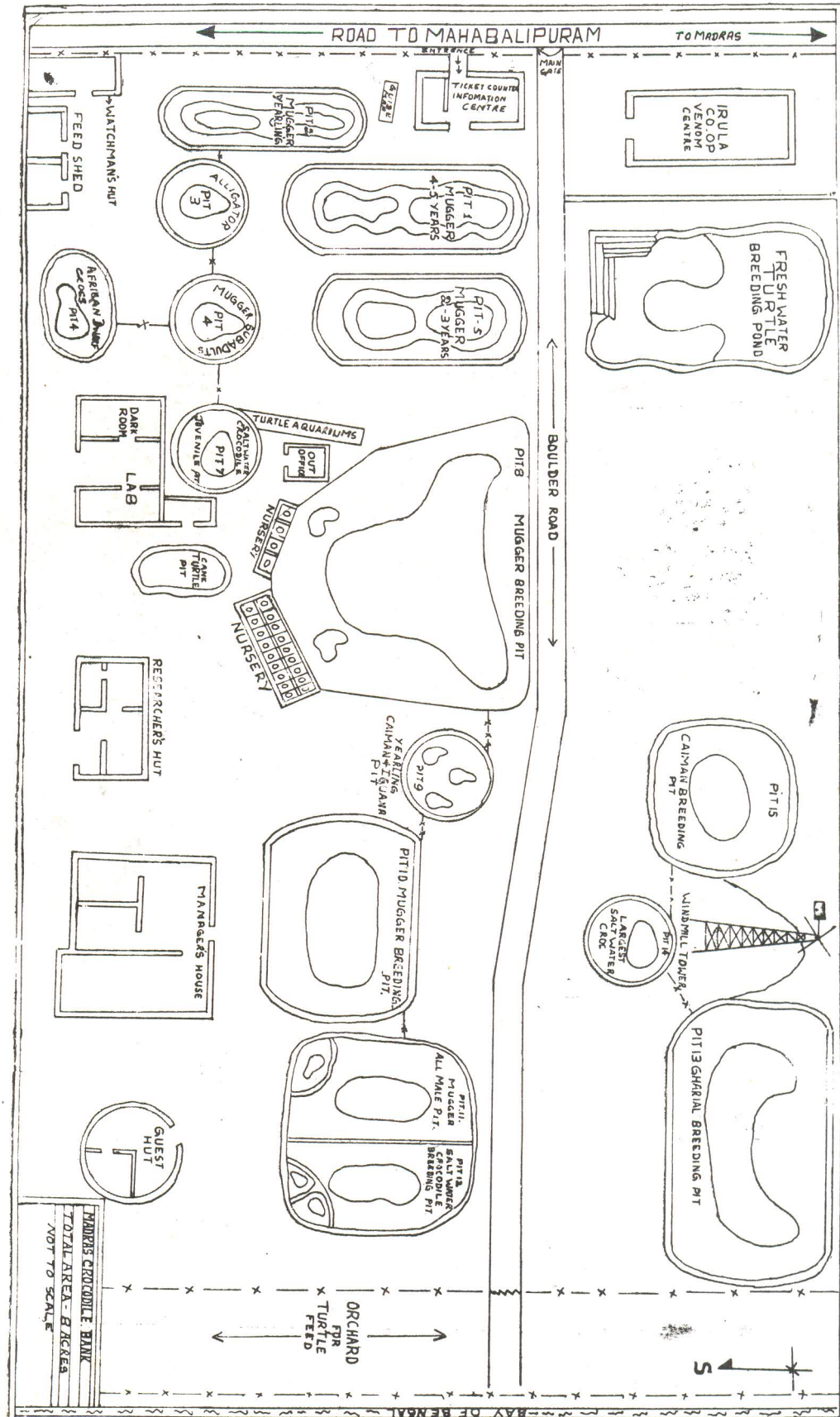


# HAMADRYAD

10 NO : 3

September 1985



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**Audco India Limited,**  
**Bombay : : Madras**

## C O N T E N T S

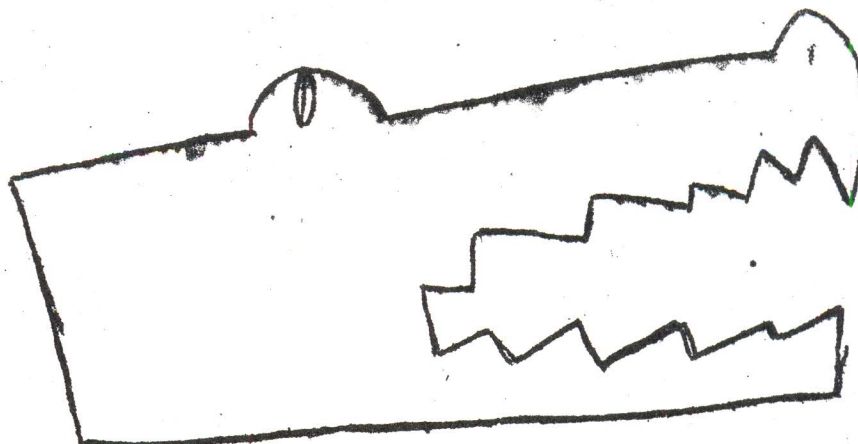
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MADRAS CROCODILE BANK  
TRUST

Objectives

To breed the three endangered Indian crocodiles for release back to the wild and other propagation projects

To study crocodiles and educate the public about their ecological and economic importance

To study and establish programmes for the conservation and propagation of other species of reptiles.

To establish an International Crocodile Bank

To promote and advertise the conservation work of the World Wildlife Fund and other organizations

The Madras Crocodile Bank Trust

In 1974 Rom and Zai Whitaker bought some coastal land 35 kms south of Madras and with help from the Madras Snake Park Trust, World Wildlife Fund, New York Zoological Society, West German Reptile Leather Association and Tamil Nadu State Tourism Department established the Madras Crocodile Bank. It was registered as a charitable, non-profit Trust in 1976.

The Bank started with a breeding group of 14 mugger (C. palustris) which had been accumulating at the Madras Snake Park from various zoos and aquaria in India. It is now 8 1/2 acres in extent with a population of 1636 crocodiles of seven species.



### Trustees

Dr. Salim Ali  
Mr. D.V. Sridharan  
Mr. E.R.C. Davidar  
Mr. R. Whitaker  
Mr. D. Lobo

Mr. Thomas Mathew

Deputy Director, Wildlife  
Regional Office, Govt. of India,  
Department of Environment,  
Madras Snake Park Trust.

\* \* \* \* \*

Honorary Secretary  
Director  
Curator  
Office Manager

: Zai Whitaker  
: Rom Whitaker  
: Harry Andrews  
: Brenda Bhaskar

### Staff:

Watchman  
Chief keeper  
Maintenance  
Office Assistant  
Ticket clerk  
Asst. maintenance keeper  
Chief maintenance  
Lab Technician  
Watch dogs  
Auditors

: Bhagat Ram  
: Munuswamy  
: Shankar  
: Mohan  
: Thangaraj  
: Boopathi  
: Periaswamy  
: Rajendran  
: Jello, Balu and Lotha  
: M/s. Ramaswamy and Company.

### Research Associates:

Jeff Lang  
Ed Moll  
D. Basu  
J. Vijaya  
Laurie Taplin  
R.J. Rao  
M.A. Reza Khan

Binod Choudhury  
S. Dattatri  
Satish Bhaskar  
Jack Frazier  
Andy Ross  
Indreneil Das  
T.S.N. Murthy

\* \* \* \* \*

### MCBT - Annual General Report (1984/85)

It's good to review what's been happening for the last year in order to plan what comes next. The only difficulty is sitting here putting it down when it would be much nicer to be outside.

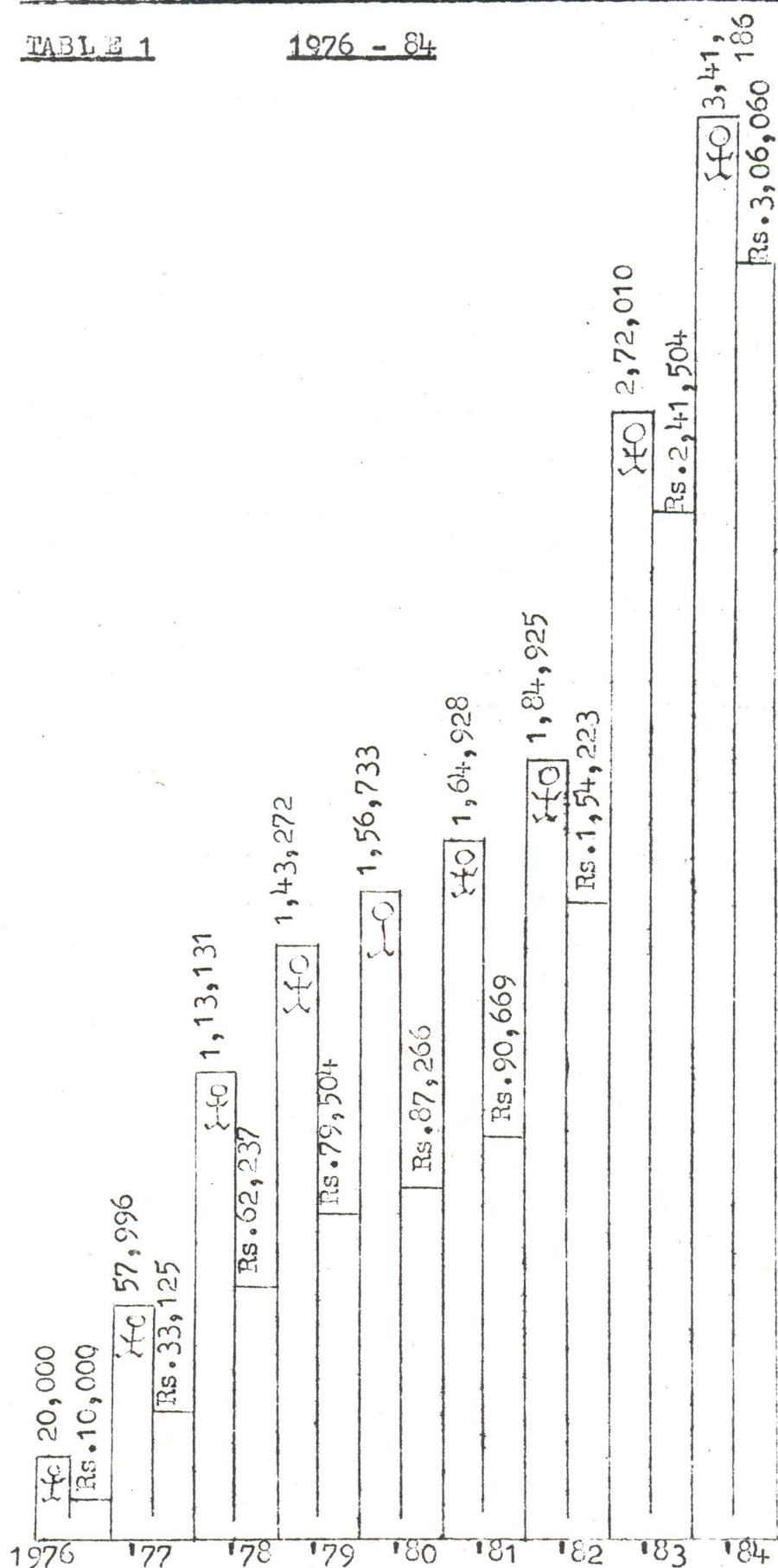
### Visitors

The Crocodile Bank had 341186 visitors last year, about 30% of them children and 7% foreign tourists. The local bus tours usually keep the Crocodile Bank as one of their standard stops and a fair share of the tourist traffic to Mahabalipuram stops to see the crocs. Two factors would help stop more tourists: More frequent local bus services and a big traffic-stopping crocodile statue on the roadside made to do just that; a 10 metre long saltwater crocodile will cost about \$6000/- but will probably pay for itself in a year or two. Nice to have the biggest stone croc in the world!

NO. OF VISITORS AND INCOME DERIVED FROM TICKET SALES

TABLE 1

1976 - 84



#### IMPORTANT VISITORS TO THE TRUST DURING 1984/85

1. Dr. Salim Ali, Bombay Natural History Society
2. Smt. Kamaladevi Chattopadhyaya
3. Thiru Ashok Gehlot, Union Minister of Tourism
4. Thiru Hokish Sema, Governor of Himachal Pradesh
5. Thiru R.S. Saaraprawira, Ambassador of Indonesia
6. Dr. Samlebu Mandi, MIC Tribal Welfare Department,  
West Bengal
7. Dr. Marie T. Dimond, Trinity College, Washington DC
8. Thiru S.P Mukerji, Secretary Dept. of Agriculture,  
Government of India
9. Thiru S.N. Kakar, Secretary to Governor of West Bengal
10. Thiru T.V. Antony, Chief Secretary, Govt. of Tamil Nadu
11. Thiru Birendra Singh, Member of Parliament
12. Thiru P.C. Phodrkar, MOS, IICA, Delhi
13. Dr. Walter Ofenberg, Curator of Florida State Museum

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#### ASSOCIATIONS AND OFFICIAL MEMBERSHIPS

1. Food and Agriculture Organization of the UN (consultancies)
2. International Trade Centre/UNCTAD (consultancies)
3. International Union for the Conservation of Nature/WWF  
(consultancies)
4. Herpetological Congress (member)
5. IUCN/SSC Crocodile Specialist Group (member)
6. Bombay Natural History Society (Advisory Committee)
7. IUCN/SSC Freshwater Chelonian Group (member)
8. IUCN/SSC Snake Group (member)
9. Sea Turtle Specialist Group of the Government of India  
(member)
10. World Wildlife Fund-India (member)
11. Society for the Study of Amphibians and Reptiles  
(Asian correspondent)



## MANAGER'S REPORT

The Croc Bank right now faces serious problems of very slow development and poor facilities due to shortage of funds. Since grants are hard to get, and the Bank surviving 85% - 90% on the ticket sales is left with little or nothing for either development or projects etc.

The admission rates for visitor to the Bank, cannot be increased, since, one of its objectives is public education and people from all walks of life must get to see it. The rates may seem very little in the present day context and people are seeing India's largest crocodile breeding centre. We feel that very little is being shown by way of public education and proper facilities, are not provided.

Plans are also underway for starting a regular research institute and training facility for researchers and students here at MCBT.

The urgently needed improvements, proposed developments and estimated costs are listed below.

- |   |                      |
|---|----------------------|
| 1) 3 acres of land, adjacent to be bought   | - Rs.2 lakhs approx. |
| 2) Water supply, piping/drainage            | - Rs.15,000/-        |
| 3) Pens for foreign crocodiles              | - Rs.40,000/-        |
| 4) New ticket office                        | - Rs. 6,500/-        |
| 5) Roofing & developing information centre  | - Rs.25,000/-        |
| 6) Electricity- rewiring & alarm bells etc. | - Rs. 5,000/-        |
- 

## INTERNATIONAL CROCODILE BANK

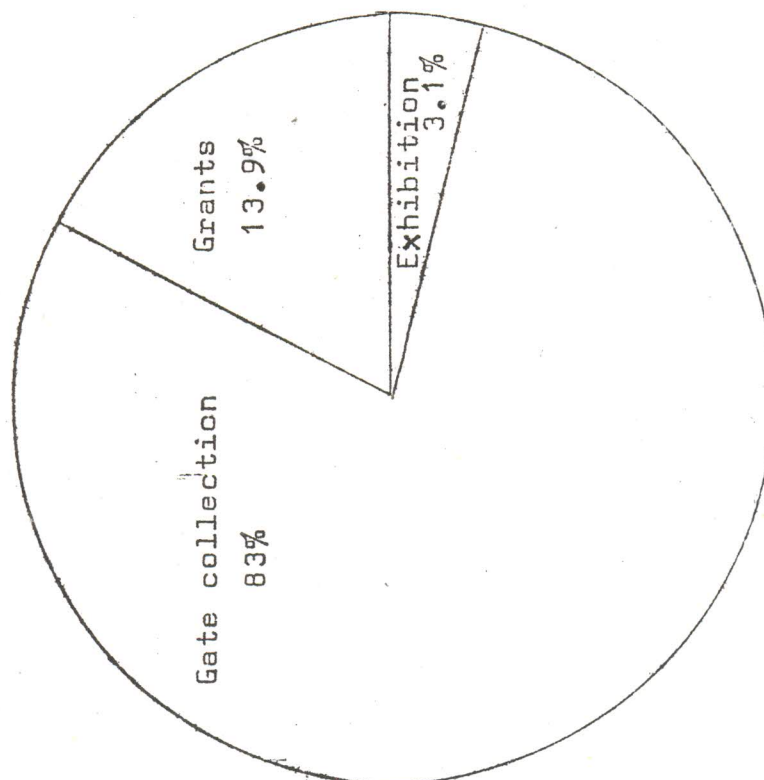
It is a laborious process to obtain the various permits needed to import crocodilians for the Bank's international captive breeding programme. Recently however the Bank has been permitted to import several species with which to establish breeding groups: West African dwarf crocodile, Malayan gharial, Morelet's crocodile, Nile crocodile and Siamese crocodile. Meanwhile funds are being sought to construct spacious breeding enclosures for the new additions which will start arriving in October or November this year.

The Siamese crocodiles given on breeding loan to the Bank by the New York Zoological Society are doing well, the juveniles have a faster growth rate than the indigenous mugger. A male American alligator, gifted by the Rockefeller Wildlife Refuge in Louisiana is patiently awaiting the arrival of several females in the not too distant future. RW.

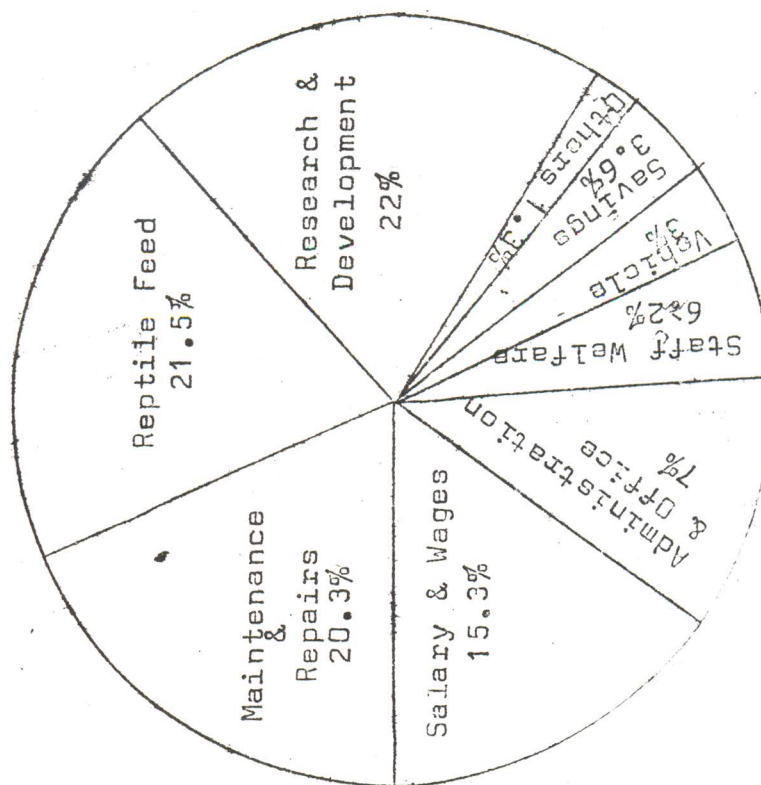


TABLE 2 AVERAGE INCOME AND EXPENDITURE - MADRAS CROCODILE BANK 1984-85

## INCOME



## EXPENDITURE



## BREEDING PROGRAMMES

### Crocodylians

Mugger, Caiman and Saltwater crocodiles produced a total of 850 eggs this year from 33 nests. Details of each species are given below:

TABLE 1, CROCODILE BREEDING RESULTS, 1985 SEASON

<u>Species</u>	<u>No. of Nests</u>	<u>No. of Eggs</u>	<u>No. of Hatchlings</u>	<u>Mortality for previous year</u>
Mugger	27	641	215	3.7%
Saltwater Crocodile	1	59	45	19.2%
Caiman	5	150	43	16.6%

### Double clutching

The unique feature of mugger breeding at MCBT which by now has become typical and very interesting is the DOUBLE CLUTCHING i.e females nesting twice in the same season with interesting interval of 30 - 57 days and 2nd nests in different locations. Young females that just started nesting for the past 1 or 2 years have begun to double nest. See table below:

TABLE 2 NO OF FEMALES DOUBLE NESTED 1979 - 1985

<u>Year</u>	<u>No. of Females Nested</u>	<u>Total No. of Nests</u>	<u>No. of Females Double Nested</u>
1979	7	13	6
1980	11	15	6
1981	9	16	7
1982	12	15	4
1983	9	12	3
1984	12	20	6
1985	18	27	9

Meanwhile very few Indian states continue to be interested in restocking areas with mugger, presumably because of lack of identified suitable habitat for mugger rehabilitation.

TABLE 3      INCREASE IN MUGGER BY CAPTIVE BREEDING  
AT MADRAS CROCODILE BANK FOR 10 YEARS

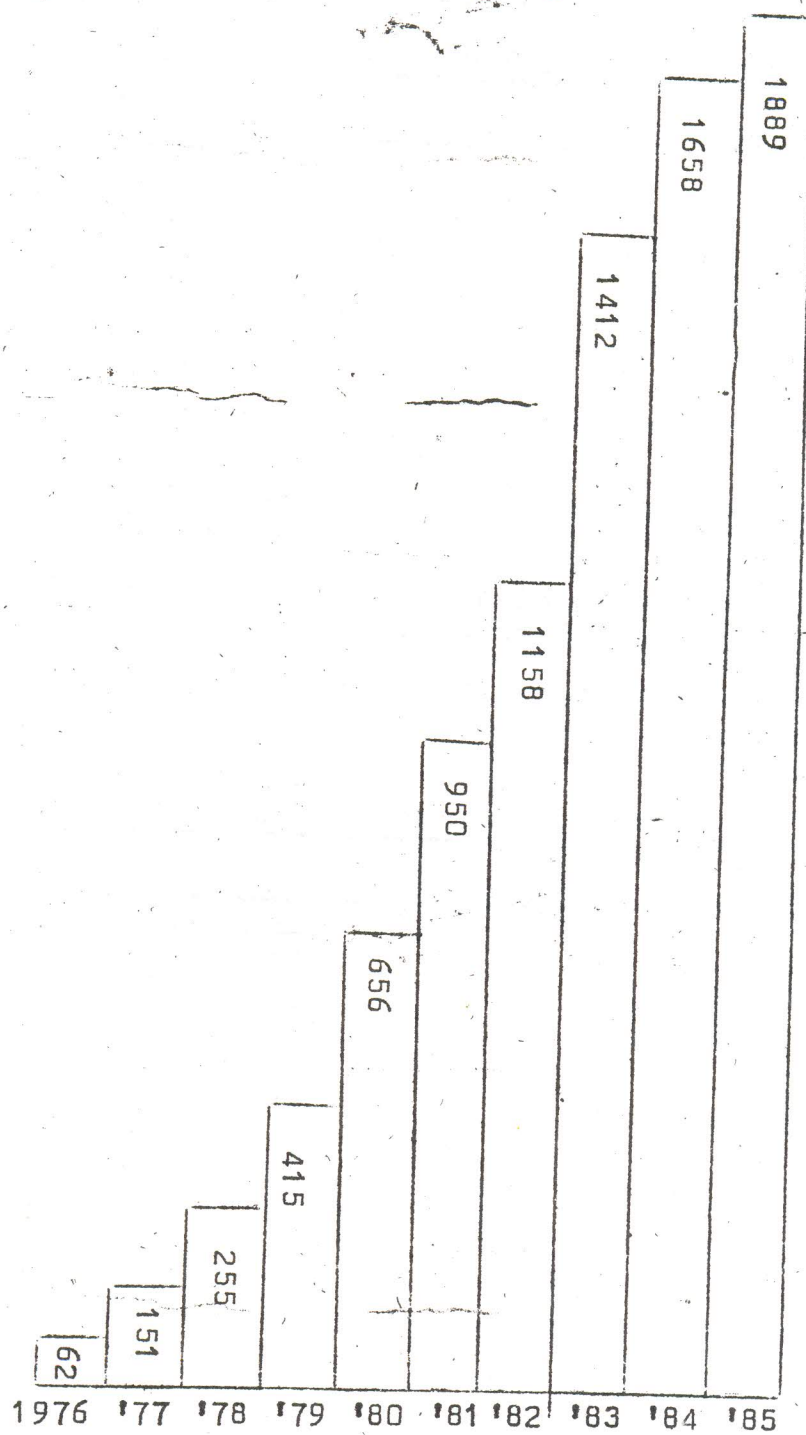


TABLE 4 MCBT STOCK POSITION (1985)

<u>Species</u>	<u>Male</u>	<u>Female</u>	<u>Unknown</u>	<u>Origin</u>
Alligator mississippi- insis	Adult 5	--	--	Rockfeller Wildlife Refuge, USA
Caiman crocodilus crocodilus	Adult 5	5	--	Panama, USA
Caiman crocodilus crocodilus	Juvenile --	--	47	Bred at MCBT
Crocodylus siamensis	Adult 1	--	--	Bronx Zoo, USA
Crocodylus siamensis	Juvenile 2	--	--	Bronx Zoo, USA
Osteolaemus tetraspis tetraspis	Adult 1	1	--	Zoo Negara
Osteolaemus tetraspis tetraspis	Juvenile 2	--	--	Zoo Negara
Crocodylus palustris	Adult 58	46	--	Wild eggs & captive bred
Crocodylus palustris	Juvenile 366	759	195	Bred at MCBT
Crocodylus porosus	Adult 3	2	--	Wild & cap- tive bred
Crocodylus porosus	Juvenile 4	22	45	Bred at MCBT
Gavialis gangeticus	Adult 3	10	--	Wild & cap- tive bred
Crocodylus niloticus Crocodylus moreletii Tomistoma schlegelii	(9)			



## Turtles and Tortoises

Four species of turtles have laid a total of about 300 eggs in the past year. 'Natural' breeding populations of Lissemys punctata live in the gharial breeding enclosure and there are smaller enclosures for several turtle and tortoise species near the nursery complex. Smaller species and hatchlings of these bred here are being reared in aquaria.

But the main development is the new freshwater turtle breeding enclosure with a 3m deep pond made with a grant from Wildlife Preservation Trust International (closely allied to the Jersey Wildlife Preservation Trust). Here 12 species have been put as breeding pairs and groups are gradually becoming acclimated to the thousands of visitors. Recently a Ganges River Turtle (a large softshell) laid her clutch of 21 eggs in the early evening in plain view; there have been three nests of this species so far this season. Table 5 gives a list of the turtles and tortoises in the MCBT breeding programme which began in 1982. Most of the turtles were collected by Research Associates J. Vijaya, Ed Moll and Satish Bhaskar.

TABLE 5 TURTLE AND TORTOISE STOCK POSITION AT MCBT (1985)

### Hard-shell Turtles

<u>Species</u>	<u>Male</u>	<u>Female</u>	<u>Juvenile</u>	<u>Breeding</u>	<u>Origin</u>
Batagur baska	-	1	1	-	W. Bengal
Cuora amboinensis	-	-	1	-	N. Bengal
Geoclemys hamiltoni	-	1	-	-	Sahibganj-Ganges
Hardella thurgi	1	2	-	-	Ganges-Bihar
Heosemys silvatica	1	2	-	-	Nadukani Vikara-Kerala
Kachuga kachuga	2	2	1	-	W. Bangal, Champaran-Bihar
Kachuga dhongoka	1	12	-	-	Chambal-UP, Ganges-Bihar
Kachuga smithi	-	2	-	-	Ganges-Bihar
Kachuga tentoria tentoria	3	13	6	-	Mahanadi River-Orissa
Kachuga tentoria-circumdata	-	--	6	-	
Melanochelys tricarinata	1	-	-	-	
Melanochelys trijuga trijuga	6M	16	30	Yes 1983-1984	Madras, Bihar & Kerala
Melanochelys trijuga coronata	2	2	-	-	Kerala, Tamil Nadu

<u>Species</u>	<u>Male</u>	<u>Female</u>	<u>Juven- ile</u>	<u>Breeding</u>	<u>Origin</u>
<u>Hard-shell Turtles (contd....)</u>					
Melanochelys trijuga indopeninsularis	2	1	1	-	Champaran- Bihar
Melanochelys trijuga thermalis	1	2	3	Yes Since 1984	S. India & Sri Lanka
<u>Soft-shell Turtles</u>					
Chitra indica	2	-	1	-	Mahanadi- Orissa
Trionyx ganget- icus	2	2	-	Yes 1985	Jamuna-Naraz, Orissa, Ganges-Bihar
Trionyx leithi	1	-	-	-	Godavari-Tamil Nadu Moyur River- Tamil Nadu
Lissemys punctata granosa (punctata)	6	5	30	Yes Since 1981	W. Bengal Around Madras, Andhra Pradesh, Uttar Pradesh, Orissa, Ganges, Bihar & Madhya Pradesh
Lissemys punctata andersoni	5	3	2	-	N. India
<u>Tortoises</u>					
Geochelone elegans	2	3	3	-	Out skirts of Madras
Geochelone elongata	-	-	2	-	N. India
Geochelone travancorica (indot- estudo forestani)	5	2	-	-	Vikara-Kerala
<u>Foreign Turtles</u>					
Pseudemys scripta eligana	1	2	-	-	U S A

## Iguanas

The common iguana has bred for three years at the Crocodile Bank which now has 73. A common reptile in its native South America it is a startling exotic here where there are no iguanid lizards and in much demand by zoos. The Bank breeds them essentially for trade for crocodiles and has already made worthwhile exchanges of iguanas for gharial and West African Dwarf crocodiles. The breeding stock of one male and 2 females measure 1.67 m and 1.44 m. (see table below).

TABLE 6 BREEDING OF THE COMMON IGUANA AT MCBT

<u>Year</u>	<u>No. of nests</u>	<u>No. of eggs*</u>	<u>No. of hatchlings</u>
1983	2	50	32
1984	2	70	45
1985	2	90	64

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\*approximate



## R E S E A R C H

During 1984-85 the main research focussed on a collaborative project on mugger with Dr. Jeff W. Lang of the University of North Dakota which is summarized below from Dr. Langs recent progress report.

**Synopsis:** The mugger crocodile is endangered on the Indian subcontinent and is currently the focus of captive breeding programs by numerous state and national agencies in India. Although little is known of the natural history of the species, the available data indicate that its reproductive biology is unique among crocodilians. Of particular interest is the ability of individual females to produce multiple clutches of eggs within a single season; in addition, incubation temperatures likely determine the sex of hatchlings. The study objectives are: 1) to describe the reproductive behaviors, 2) to investigate multiple clutch production 3) to quantify thermal effects on development 4) to determine the temperature thresholds for sex determination and 5) to formulate management recommendations based on this research which are relevant to rearing and breeding programs now underway in India. The proposed study is being conducted at captive breeding facilities at the Madras Crocodile Bank in Tamil Nadu, South India in collaboration with Indian workers.

**Behavioral studies:** These studies were initiated in 1983 prior to my arrival at the Madras Crocodile Bank (MCB) by Romulus Whitaker and staff. In September-October 1983, adult crocodiles within two breeding enclosures (pit 8 & 10) were captured, sexed, weighed and measured and tagged individually with easily visible neck, body and tail tags; most of the animals have retained these tags (through October 1984) which continue to permit identification for behavioral studies. Discrete behaviours have been categorized on the bases of previous observations of mugger and other species (Whitaker and Whitaker, 1982; Garrick and Lang, 1977; Lang, 1980). Although these behaviors have yet to be described and documented in detail for mugger crocodiles, each behavior is sufficiently distinct so as to be easily recognized and recorded by trained observers. Daily observations of the main breeding enclosures (pit 8; 1 male and 7 females) by two observers were begun in October 1983 (0600 - 1800) hrs each day with periodic 24 hr observation) and continue at present. These observers are being supervised by a resident research assistant under direction.

**Multiple Clutch Production:** the production of multiple clutches of eggs within a single season by female mugger crocodiles has been well documented at the MCB since 1976. Specific information is available for individual females which includes data on origin, age, growth rates, notes on yearly reproductive behavior, details of nesting events and of hatching success. In 1984, two young



females (6 yrs old) in an additional enclosure laid second clutches for the first time. Thus, multiple clutch production is apparently a general feature of breeding at the MCB and does not appear to depend on particular females, males or enclosure settings. These records which are extensive and accurate permit detailed analyses of nesting patterns at MCB; for example, detailed maps of the location of nests (including "a" and "b" nests for individual females) are available for each year since 1976. Compilation and analyses of these records are now underway; these data will of use in determining factors which contribute to multiple clutch production.

Increased food consumption and/or elevated temperatures are two factors which may contribute to multiple clutch production. Preliminary data have been obtained on the daily body temperatures of individual females during the nesting period at MCB. Environmental parameters routinely monitored at 1-2 hr intervals included: air, water and substrate temperatures, solar radiation, wind speed. Body temperatures were monitored via temperature transmitters at 30 minute intervals. Data collection for daily records was routinely supervised and carried out by a research assistant and observers.

To date, these preliminary data indicate that 1) adult females are maintaining relatively high body temperatures (30 C) during the nesting season at MCB, 2) land-water movements typically consist of heat avoidance during the day-time and at night, and 3) these behaviors result in body temperatures at or near bottom water temperatures during the day and in body temperatures below water temperatures at night. As yet, no data have been obtained for the periods before and during nesting, but these preliminary results do demonstrate the feasibility and utility of monitoring environmental and animal temperatures and other relevant variables. These data also provide information on the environmental constraints on the daily pattern of activity, particularly of social and reproductive behaviors. Because incubation temperatures likely determine embryonic sex, the body temperatures of gravid females and the thermal characteristics of the nest site are of special interest.

Nest parameters: Parameters used to characterize nest environments have been routinely recorded at MCB for nests laid from 1976 to present. These include physical dimensions of the nest, its location within the enclosure, and representative temperature and moisture conditions. These data are presently being compiled and will be used in future analysis.

Data was recorded for 20 nests laid in three breeding enclosures in 1984; of these, pit 8 contained older, mature females (6 yrstold). Pit 10 contained younger females (6 yrs old); and pit 7 contained the youngest females (5 yrs old) reproducing for the first time in 1984. Mean clutch size is 27.6 eggs/nest; average nest dimensions are 31.6cm to the bottom and 19.6 cm to the top of the nest. Considering the eggs of the females



in the three enclosures, these data suggest that 1) older females lay more eggs in deep nests, and conversely that 2) younger females lay fewer eggs in shallow nests.

Nest depth is likely to be an important factor affecting the thermal regimes to which the eggs are exposed during incubation. The diurnal cycle of temperature within a crocodile nest was monitored for six weeks during April and May 1984. Temperature sensors were placed at depths of 20 cm (top) and 35 cm (bottom) within the nest and monitored at hourly intervals with an automated temperature recorder. It is evident that soil temperature at a nest depth of 35cm remains nearly constant whereas the temperature at 20 cm varied by 0.5 - 1.5 C. At depth of 20 cm, the daily maximum temperature was reached at 1800 - 2200 hours; at 35 cm, maximum temperatures were reached between 0600 - 1200 hrs.

These data emphasize the importance of nest depth, time of day, and the method of measurement as factors affecting nest temperature and its measurement. On the bases of these preliminary data, suitable protocols have been developed for recording and comparing the thermal regimes within nests during incubation using automated and manual methods of measuring nest temperatures.

Seasonal changes in nest temperature were marked during a three-week period of automated measurements made in 1984. Daily temperatures at 1800 hrs at a depth of 20cm increased gradually from 30.8 to 33+ C; at a depth of 35 cm., nest temperatures increased from 29.7 to 31+ C during this same period. Such seasonal increases in nest temperature parallel seasonal increases in ambient air temperature. The probable effect of seasonal increases in nest temperatures throughout the nesting-incubation period are discussed with regard to embryonic sex determination in a subsequent section.

Temperature-dependent sex determination: Three approaches are being used to elucidate aspects of temperature-dependent sex determination (TSD) in mugger crocodiles at the MCB. These include: 1) experimental procedures using artificial incubation to determine the threshold (pivotal) temperature(s) and critical period(s) for sex determination of embryos during development, 2) determination of sex ratios of surviving hatchlings and juveniles from nests within enclosures at the MCB (1977 - 1984) and correlation of sex ratio/nest with seasonal and other factors known to affect nest temperatures, and 3) mapping of the nests (from the enclosures) just prior to hatching to determine the relationship between the position of an egg within a nest and the sex of the corresponding hatchling.

Artificial incubation at constant temperature: Freshly laid eggs at MCB were incubated in artificial incubators of varied design (Figure 9) at constant temperatures of 28-30, 30, 32, 34 C; about 50 eggs were incubated at each of these temperatures. Despite some mortality apparently due to high temperatures, viable hatchlings were obtained at all temperatures; and these individuals will be sexed at 6 months (Oct - Nov 1984) to provide preliminary data on TSD. As noted above provisions have been made for adequate temperature control and a controlled-environment



room at the MCB for 1984-85 experiments.

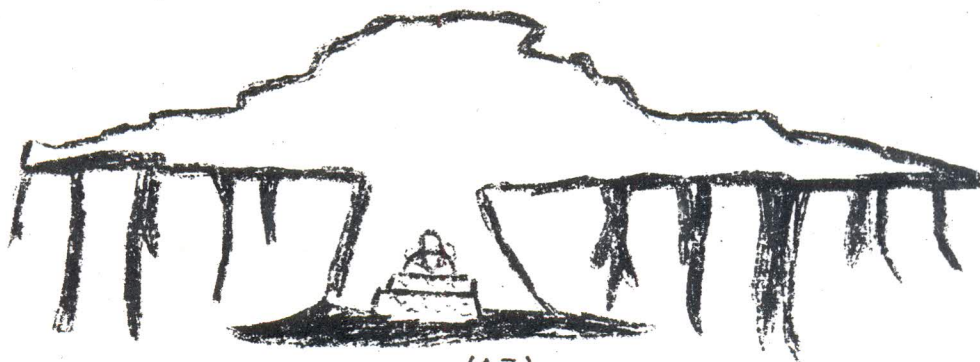
Nest sex ratios: The sexes of 714 juvenile mugger crocodiles at the MCB were determined by capturing and examining marked individuals. These animals were hatched from known nests within enclosures during 1977-83. In most instances, detailed information is available for each clutch of eggs regarding identity of female, time and location of nesting, nest temperatures, hatchlings surviving, etc. Using the sex ratio of the surviving juveniles from each nest as the best available indicator of the sex ratio of each nest at hatching, I compiled the yearly and overall distributions of nest sex ratios. The overall distribution of nest sex ratios for 1977-83 was markedly bimodal and strongly skewed toward females; year to year variations were also evident, particularly during 1981 and 1982 when some nests contained males and females (% males = 40 - 60%). When these same data are considered in relation to the time of nesting (= date of egg laying) on a monthly basis, the overall sex ratio averages 7% in February, 32% in March and 45% in April; considerable year to year variations were evident. However, these data indicate that the time of nesting, whether in February March or April is likely to be a major factor in determining the sex ratio of an individual nest.

Nest maps: The third approach I am using to investigate TSD at MCB is the mapping of undisturbed nests in the enclosures. Just prior to hatching, each nest is carefully mapped to determine the relationship between egg position and the sex of the resultant hatchling. Each egg is mapped with respect to position within the nest and clutch and numbered before removal to a separate container in which the egg hatches. Hatchlings emerging from numbered eggs are marked individually and sexed at 6 months of age. Eggs were mapped in 10 enclosure nests in 1984; nest maps will be constructed when the hatchlings are sexed in October-November 1984. These data will compliment other methods of determining TSD during embryonic development, and should be instructive in identifying and studying variables contributing to sex differences within and among clutches.

Practical recommendations: It is premature to formulate recommendations on the bases of these preliminary data. However, it is already clear that definite management recommendations will be forthcoming as the research progresses. These will include specific instructions regarding egg collection and incubation techniques for safely monitoring development during incubation and methods for distinguishing "healthy" eggs, and guidelines for enhancing and managing the reproductive output of captive breeding programs such as those underway at MCB.

Proposed study objectives: The specific study objectives are:

- 1) to continue to describe and document the reproductive behaviors of the mugger crocodile, particularly courtship and mating behavior in relation to nesting and nesting behaviors in relation to embryonic sex determination.
- 2) to continue to investigate factors influencing the production of multiple clutches of eggs by individual females within a single season at the MCB, and to extend these investigations to include information on the seasonal nesting patterns of wild crocodiles in Tamil Nadu.
- 3) to continue to characterize nest environments and thermal characteristics of captive-laid and wild nests, and to determine the major factors affecting the sex and survivorship of embryos/hatchlings.
- 4) to continue to examine embryonic sex determination in relation to incubation temperature, and in particular to determine the critical period for sex determination and in what ways the critical period is influenced by initial incubation temperatures.
- 5) to determine hatchling survivorship and growth as a function of sex, feeding regimes, thermal conditions and preferences, stocking densities, pen configurations and other relevant factors.
- 6) to continue to formulate practical recommendations for captive breeding and incubation schemes and to continue to collaborate in all of these objectives with Indian scientists, conservationists, and others working on the biology, management and conservation of crocodilians in India.





S.B. Mishra, Research Assistant, writes from the National Chambal Sanctuary, Uttar Pradesh:

At about 17.00 hrs on 16/10/84 I saw a Kachuga tentoria on the bank of the Chambal river approximately 30 m from the water. Suddenly a jackal appeared and, before I could intervene, severely bit the turtle which, on close inspection, proved to be a female that had come up to nest and has just completed excavating its nest. The female was bleeding freely at this time and died an hour later. Jackals are likely to be common predators of nesting turtles in this area.

Dissection revealed:

- a. Ovarian follicles : 6
- b. Oviducal eggs : 6
- c. Eggs : 6

The six eggs ready for deposition measured as follows:

Minimum length	:	42.2 mm
maximum length	:	44.4 mm
Average	:	43.3 mm
Minimum width	:	20.9 mm
Maximum width	:	27.8 mm
Average	:	26.2 mm

Weighed an average of 19.4 gms (n 3).

The female measured as follows:

Carapace length: 233 mm; carapace width: 224 mm;  
weight: 1250 gms.

During this field study from 27/10/84 to 29/10/84, I found several nests of Kachuga tecta, Kachuga tentoria, and Kachuga smithi; some of the details of which are given below:

Species	Clutch size	Egg size (average)		Nest temperature
		Length	Width	
K. tecta	10	4.70cm	2.68cm	29 C (6AM)
K. smithi (24 nests)	4-10	4.95cm	2.71cm	27.5 C (8AM)

Mr. Mishra thanks the Uttar Pradesh CCF Mr. C.B. Singh, Conservator of Wildlife Mr. R.S. Bhaduria, Maharaja Shri Niranjan Singh, DFO Mr. P.C. Agarwal and Kanpur Zoo Director Mr. G.C. Mishra for encouragement and facilities.

SATISH BHASKAR WRITES FROM IRIAN JAYA

Medi River Beach - 25 June, 1985

The first leatherback I tagged was nesting during the day in April. The next time I saw her she was laying at night like all good turtles, but on a beach 12 km from the earlier spot, and in June, after an interval of 54 days. She must have come up totally 6 or 7 times to lay but since the total beach is 18 km long, I missed all her in-between nestings. I do walk the 18 km every other night, tagging turtles and counting tracks all the way, and on the nights in between I concentrate on all the tagging on a particular favoured 3 km stretch - so far I have only one Forest Department man to help out with things, but 2 PHPA gentlemen from Bogor are expected to stay 2-3 months with me soon. So far we have tagged only about 300 leatherbacks - we should be tagging something like 2000 before the season is through if the minimum estimate I made last year (i.e., 13000 nest/season) is to be realized. At this rate we will fall short by perhaps 1000 turtles but of course, the season is just getting underway now.

To 'Post' letters from this beach I have to swim out with them for 100 metres or so each time a longboat passes by, heading for Sorong. There is only one boat which does so, at intervals of about 20 - 30 days.

Medi River Beach - 9 August, 1985

We have been getting to photograph leatherbacks by day. One got stranded inshore on a riverbed and would have died had we not directed it back to the beach via a low portion of the sand cliffs lining the river. A few days earlier, another one that had blundered into the riverbed died, presumably from the hot sun. It took 3 of us, 4 hours to cut it up piecemeal and weigh it (together with its blood and guts etc.) even though it was a small nester: only 273kg.

My Irianese co-worker, Mesak, from the PHPA regularly catches large fishes, 1-3 kg in weight at the rivermouth using a thrown hook and line; all of these have their stomachs packed with baby crabs if caught in the morning, empty if caught in the late evening. One of them even had an intact leatherback hatchling in its stomach. Visiting fishermen have caught about 50 sharks a few km offshore, and their camp about 10 km east of here smells like an abattoir (even the sea does around that area!).

So far we have tagged almost 700 leatherbacks and it is getting difficult to find an untagged one on the beach now.

P.S. We saw a truly beautiful, large "Ular Putih" (White snake", Misropechis sp.) in the forest near the camp. Ron Petocz got some close-ups of it. Two weeks ago, a man died from an Ular Putih bite 100 km from here on the coast.

(Micropechis ikaheka apparently causes a fair number of deaths throughout the island of New Guinea. A catholic priest in Madang, Papua New Guinea told us of several deaths there. No one has studied the venom nor is there



an antivenom serum for the bite. The tiger snake antivenom from Commonwealth Labs in Melbourne, Australia has been found to be effective in treating bites of many of the elapids of that region and must be used in an emergency. But the venom deserves study as bites will become more frequent with the opening up of the jungle. R. Whitaker)

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#### HERP NEWS CLIPPINGS

##### SNAKESKIN CONSIGNMENT SEIZED IN COCHIN

Indian Express, September 9, 1985

A huge consignment of snakeskins was discovered by the Cochin customs on Saturday morning, concealed in tins of cashew bound for Singapore.

Detailed examination of the cargo was going on throughout the day and officials expected the total seizure to come to over 40,000 snakeskins. By the evening of Saturday, 25 tins were discovered to contain over 4,000 snakeskins. Each skin is believed to have a value of around Rs.100 within the country and five times abroad.

Snakeskins, an item totally banned for export, has a very high value in the foreign market and is used for making handbags, purses, belts and slippers by rich people. They are smuggled out in very large quantities through Bombay and Madras, but the first time this seizure has been made in Cochin.

The snakeskins seized in Cochin are around a metre and a half long and 12 to 15 cm wide. They are in bundles of 25 each and each tin has six to seven bundles.

In all 325 cartons weighing 25 kg each and containing 650 tins have been brought to the port by the exporter "Jaya Cashewnuts" of Quilon. The consignment was being sent to "Buddry and Sons" of Singapore.

The owner of "Jaya Cashewnuts" Jayakumar, who was camping in a private hotel here is reported to be absconding and Customs officials are after him. He is understood to be the son of a leading lawyer of Quilon.

The entire consignment of cartons was destuffed from the container in which it had been stacked and shifted to the customs, shed, where a detailed examination of the cargo was going on till late in the evening. The container was completely stacked and about to be loaded on to a vessel bound for Singapore when the customs detained it on suspicion. The ship left Cochin two days ago.

The credit for unravelling this smuggling attempt, in which a unique modus operandi has been adopted, goes to the port workers and the surveyor as well as the customs. The consignment was brought to the Cochin Port by the clearing agent, Pilmen Agents (Pvt) Ltd. (a well established firm which primarily deals in cashew exports) about a week ago and the customs officials after a random examination of five cartons, all of which contained cashew, cleared it for export.



The Dock Labour Board workers started stacking the cartons into the container and during the loading operations on Tuesday night the fork lift being used, accidentally pierced one of the cartons and a tin inside it. Instead of the cashewnuts falling out, sand, pebbles and small stones started rolling out of the tins to the surprise of the workers and they reported the matter immediately to the sharp authorities, who in turn contacted the customs officials.

**Suspicion:** Suspecting initially that the exporter was trying to cheat the buyers abroad and sending sand, pebbles, and substandard cashew instead of the quality stuff it was supposed to be, the customs officials on Wednesday decided to conduct a detailed examination of the cargo. Friday morning was fixed for the inspections and the representatives of the exporter was asked to be present, but strangely they did not turn up at that particular time even though they had been hanging around the area.

This further aggravated the suspicion of the customs officials and they decided on Saturday morning to open the cartons without the exporters representatives. Around 10.30 a.m. four cartons out of five were discovered to contain around 500 snakeskins. The pebbles and the sand had been filled in the tins so that the weight of the tins containing snakeskins could be balanced with those containing the actual cashewnuts.

The seals of the export inspection agency placed on top of the tins were intact, but the bottoms of the tins appeared to have been taken apart and then re-soldered together. The customs officials presume that the tins were filled with cashewnuts when taken to the EIA for inspection but after they had placed their seals, the bottoms were opened, cashewnuts taken out and then the snakeskins and pebbles put in.

**Intensive search:** Actually even the booking of the container was very intelligently done by the smugglers. While around 750 cartons can normally fit into one container, the exporter booked a whole container for his 325 cartons. This meant that the whole container would be delivered to the party abroad in his house or godown directly and no snags need be feared due to the unloading of other goods. It is also understood that the absconding exporter contacted a senior IAS official of the city and had him unsuspectingly recommended to the customs that the consignment should be released as soon as possible.

The clearing agent was brought to the customs house and questioned in detail by the customs officials on Saturday itself. A search was conducted in the major hotels of the city for the missing Jayakumar but officials met with no success. A party of the customs left for Quilon by the evening to raid the premises of the cashew company there and to interrogate other persons involved with the firm.

Investigation into the case is being conducted by customs officers C.K. Ravindran Nair, K.N. Sethumadhavan, Thomas and Thankappan Pillai, led by Assistant Collector K.R. Dass.

## FROGLEG EXPORTS WILL NOT SPREAD MALARIA

Indian Express, September 21, 1985

The Malaria Research Centre here has discounted the fear among environmentalists that export of froglegs to the western countries would lead to spread of malaria.

"The export of **froglegs** is being done mostly from the Southern States, including Kerala, where malaria is not rampant", scientists of the centre said.

"It does affect the ecological imbalance since frogs eat insects, but there is no danger of spread of malaria and pollution of environment," they said. "Only tadpoles eat mosquito larvae".

"The breeding of frogs in the countryside should be a new idea to meet the loss of frog population and earn foreign exchange," they said.

The scientists sand the reemergence of malaria in the North, particularly in the north-eastern region, is a malarial management problem.

The Andhra Pradesh Government took the lead by imposing a blanket ban bringing frogs under the purview of Wildlife Act.

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REPRINTS AND PUBLICATIONS AVAILABLE AT MADRAS CROCODILE

AND TRUST

The following is a list of herpetological and other publications produced by staff of the Madras Snake Park and Madras Crocodile Bank from 1969 to 1985. Most appeared in Indian journals such as the Journal of the Bombay Natural History Society (JBNS) or Indian Forester (IF) and are not easy to get. MCBT is offering these reprints and other publications at cost, the rates of copying and postage are given below. Being a non-profit organization the Croc Bank has to break even but we welcome newsletters and reprints in exchange.

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### JUNGLE TRAILS

Jungles are a fascinating feature of the South Indian scene. In type and composition the range is wide. They offer ample scope for study and recreation.

Jungle trails are specialist tour operators established to cater to lovers of nature and fill a special need, namely wild life tourism. The area of operation is the South Indian jungles; particularly the Nilgiri and Anamalai hills, the wildlife sanctuaries in Tamil Nadu; south Karnataka (Bandipur, Nagarhole and Ranganthitoo); and parts of Kerala (Wynaad, Eravikulam and Periyar). The base of operation will be the Nilgiri Hills.

Jungle trails has set up facilities in the 1000m. high plateau at the base of the Nilgiri mountains (near Masinagudi village); in the extensive forested tableland (one of the few true wilderness areas left) where three well known wildlife refuge namely, Mudumalai, Wynaad and Bandipur are situated. It is one of the largest blocks of jungle to be found in the sub-continent, encompassing a variety of forest types and possessing rich faunal and floral wealth. A stone's throw away is the 2200m high Nilgiri plateau which has its own unique flora and fauna.

Among the facilities available now are a jungle environment for stay, transport and personnel for conducting wildlife tours. Organising trips into the jungle for observing, studying and photographing wildlife; treks along jungle trails; assisting botanical and zoological field expeditions; setting up Nature Camps for students and conducting courses on environment and conservation to promote ecological awareness. These will be the activities of Jungle Trails. Assistance can be provided for organising mountaineering, sport fishing and other adventure sports.

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